## REMARKS

Claims 1-22 remain in the application.

### *Drawings*

Applicant acknowledges the requirement for formal drawings and will provide them, as requested, when the application is allowed.

### *Information Disclosure Statement*

JPL's SPICE and AGI's Navigator are prior art products that are not necessarily material to the patentability of the present invention since they are lacking in the features provided by the present invention. Additionally, these products are not patents or publications suitable for submission in an IDS. Applicant submits that the disclosure in the specification has satisfied the duty of candor.

AGI's STK and its Astrogator module are disclosed for purposes of enablement and best mode and are not prior art in that they are essentially applicant's commercial embodiment of the present invention.

### *Claim Rejections - 35 USC § 112*

### *First Paragraph*

Claims 1-22 were rejected under the first paragraph of 35 USC § 112 as failing the description requirement. Applicant traverses this ground of rejection.

Per the independent claims 1, 14, 17, and 20-22: Applicant notes that "coordinate systems and primitives" discussed by the rejection in the Office Action, i.e., vectors, axes, points, coordinate systems and other elements and combinations thereof that are required to describe the position and motion of rigid bodies in three-dimensional space (e.g., spacecraft orbits, trajectories, and maneuvers) are *spatial objects*. As per page 4, lines 8-9 of the specification "It is

another object of the present invention to provide a method of creating new spatial objects based on pre-existing parent objects." Therefore, the claimed parent objects and target objects are clearly *spatial objects*.

The rejection in the Office Action is based on the premise that "the specification provides no information on precisely **how** the claimed invention finds the target object in terms of the parent object or **how** the building operation obtains transformation based on parent objects. The specification gives no algorithms, techniques, or adequate description that would allow one skilled in the art to make and/or use the invention."

Applicant first submits that one skilled in the art has a very high level of understanding of spatial objects; one skilled in the art of the present invention is *literally* a "rocket scientist." Applicant also submits that the scope of the claims is commensurate with the specification and that the Applicant has not claimed any algorithms, but rather the broader underlying technique of creating a desired target (spatial) object based on one or more pre-existing parent (spatial) objects.

As to the "**how**" for finding and building operations, Applicant clearly discloses that in the detailed description on pages 9 to 11. For "finding," for example, a target point is found by parent coordinate systems 1-N, a target coordinate system is found by parent coordinate systems 1-N, a target vector is found by parent axes 1-N, a target axes is found by parent axes 1-N, and a target point is found by parent coordinate systems 1-N, as illustrated on pages 9-10:

> "Referring to **Fig. 1A**, a basic functional relationship is illustrated between a point and coordinate system primitives. The basic FindIn function **110** is called by a point object **120** and finds that point object **120** in existing coordinate system objects 1 through N **130**.
>
> Referring to **Fig. 1B**, a basic functional relationship is illustrated between a coordinate system and coordinate system primitives. The basic FindIn function **110** is called by a coordinate system object **140** and finds that coordinate system object **140** in existing coordinate system objects 1 through N **130**.

Referring to **Fig. 1C**, a basic functional relationship is illustrated between a vector and coordinate system primitives. The basic FindIn function **110** is called by a vector object **150** to find that vector object **150** in existing axes objects 1 through N **160**.

Referring to **Fig. 1D**, a basic functional relationship is illustrated between a set of axes and coordinate system primitives. The basic FindIn function **110** is called by an axes object **170** to find that axes object **170** in existing axes objects 1 through N **160**."

For the "building," for example, a vector is combined with a point to define a point, two or more vectors are combined to define a vector, two non-parallel vectors are aligned to define an axes, and a point and an axes are combined to define a coordinate system. Each of these are "transformed" by the user providing a link to an existing spatial object of the appropriate type, as illustrated on pages 10-11:

"Referring to **Figs. 2A-2D**, the basic constructional relationships among coordinate system primitives are represented. In these figures, single arrows represent links between pre-existing objects (in the lower ellipses) and the object to be constructed (in the upper ellipse). The double arrows denote required explicit input from the user via the computer program's user interface, a data file, or another source. The words and symbols in square brackets describe the operations that must be performed on the data supplied by the linked objects. It should be noted that there must be a fundamental point and fundamental axes specified directly by the user. These must be defined independently of other objects, since they define the original coordinate system (i.e., the base of the universe). This definition by the user may be explicit, or it may be a tacit adoption of a default universe.

Referring to **Fig. 2A**, basic constructional relationships between a new point **210** and existing coordinate system primitives **214, 218** are illustrated. In this case, an existing vector **214** is combined with an existing point **218** to define a new point **210** in space. The user provides a link to an existing (parent) coordinate system.

Referring to **Fig. 2B**, basic constructional relationships between a new vector **220** and existing coordinate system primitives **224, 228, 232, 236** are illustrated. The new vector **220** may be defined by a vector operation taken on two or more existing vectors **224**, chosen from existing vectors 1 through N **224**. Alternatively, the new vector **220** may be defined by the first derivative of an existing point or vector **228**. As yet another alternative, the new vector **220** may be defined based on the difference between two existing points **232, 236**. In each case, the user provides a link to an existing (parent) set of axes.

Referring to **Fig. 2C**, basic constructional relationships between new axes **240** and existing coordinate system primitives **244, 248** are illustrated. In this

case, two existing vectors **244**, **248** (which should be non-parallel) are aligned to define a new set of axes **240**. The user provides a link to an existing (parent) set of axes.

Referring to **Fig. 2D**, basic constructional relationships between a new coordinate system **250** and existing coordinate system primitives **254**, **258** are illustrated. In this case, an existing point **254** and an existing set of axes **258** are assembled to define a new coordinate system **250**. The user provides a link to an existing (parent) coordinate system."

Applicant finally submits that the rejection in the Office Action and discussion of "**how**" is more of an enablement issue. Applicant submits that the description in the detailed description of the invention, discussed above, is thoroughly enabling to one skilled in the art. Additionally, for those of lesser skill, Applicant has disclosed the best-mode and enabling description of how to practice the invention - using the commercial-off-the-shelf (COTS) "Astrogator module of the Satellite Tool Kit (STK) program developed by Analytical Graphics, Inc. of Malvern, Pennsylvania."

For the above-mentioned reasons; Applicant submits that the written description satisfies the requirements of the first paragraph of 35 USC § 112 and requests reconsideration.

***Second Paragraph***

Claims 1-22 were also rejected under the second paragraph of 35 USC § 112 as being indefinite. Applicant traverses this ground of rejection.

The "combined transformation" objected to in the Office Action is, as discussed in the Office Action, described in the detailed description:

> "Certain of the above objects are obtained, according to the present invention, by a method of creating a desired target object based on a pre-existing parent object and on information explicitly provided by a user. The method includes performing a finding operation to find the target object in terms of the parent object, using the information explicitly provided by the user, to obtain a first transformation, as well as performing a finding operation to find the parent object with respect to the target object, to obtain a second transformation. Additionally, the method includes combining the first and second transformations to create the target object."

As discussed earlier in the detailed description, the user input required to perform the transformations include "a fundamental point and fundamental axes specified directly by the user. These must be defined independently of other objects, since they define the original coordinate system (i.e., the base of the universe). This definition by the user may be explicit, or it may be a tacit adoption of a default universe... [and later that t]he user provides a link to an existing (parent) coordinate system...[or] to an existing (parent) set of axes." A transformation of the spatial objects of the present invention to a default coordinate system or a default set of axes is well known to those skilled in the art.

User input (i.e., "what information") in the present invention relates to parent objects (points, vectors, axes, etc.) and default coordinate systems or sets of axes used for a final transformation.

The statements in the Office Action related to "hierarchical data techniques" and "simple data search techniques" clearly illustrates that the Office Action has failed to understand the meaning of the words "target object" and "parent object" as *spatial objects*, such as points, vectors, axes, etc., which relates the present claims to the position and motion of bodies in three-dimensional space and spacecraft maneuver analysis.

For the above-mentioned reasons, Applicant submits that the claims satisfy the requirements of the second paragraph of 35 USC § 112 and requests reconsideration.

***Claim Rejections - 35 USC § 102***

Claims 1-22 were rejected under 35 USC § 102(a) as being clearly anticipated by the Lilly publication. Applicant traverses this ground of rejection. Although the Lilly publication uses the words "object," "transformation," and "coordinates" and deals with modeling orbiting

and rotating bodies, it has nothing to do with the present invention. The term "object" in Lilly refers to *modeled physical objects*, such as a planetary body or its satellite, not *spatial objects*, such as points, vectors, axes, and coordinate systems, as used and claimed in the present invention. "Transformation" in Lilly is cited with respect to the UTF8 superset of ASCII, not the transformation of *spatial objects*, as used in the presently claimed invention. "Transform" in Lilly is a keyword of VRML that is merely used to create viewed objects in the *given* x, y, z coordinate system, much as "PositionInterpolater" is a VRML keyword translates bodies to the specified x, y, and z coordinates, such that it is clear that Lilly defines viewed bodies within a *single coordinate system* - thereby making the present invention entirely unnecessary within the system of Lilly.

Claims 1-22 were rejected also under 35 USC § 102(e) as being clearly anticipated by Shapiro et al. Applicant also traverses this ground of rejection.

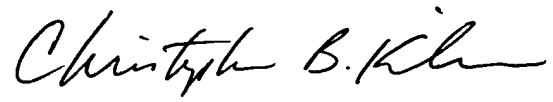
Although Shapiro et al., unlike Lilly, at least involves multiple coordinate systems, it also has little to do with the present invention. The term "object," again, refers to physical objects and not spatial objects, and the Shapiro et al. patent is drawn to the determination of the largest subset of points (a *subset* of spatial objects) that remains within a set of points S (*set* of spatial objects) when S is subjected to motion. The system uses an iterative process (see figures 13, 14 and 15) and does no finding of a target (spatial) object in terms of each parent (spatial) object or building operation to obtain a combined transformation based on the parent objects wherein *the target object is created by the combined transformation of the parent objects*, as required by the present claims.

In view of the above arguments, Applicant respectfully submits that claims 1-22 are novel and non-obvious over the cited prior art.

*Conclusion*

For the reasons cited above, Applicants submit that claims 1-22 are in condition for allowance and requests reconsideration of the application. If there remain any issues that may be disposed of via a telephonic interview, the Examiner is kindly invited to contact the undersigned at the local exchange given below.

Respectfully submitted,



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